CLAIMS

What is claimed is:

1. A wireless transmit receive unit (WTRU) for implementing forward error detection decoding (FEC) of received communication signals comprising:

a demodulator configured to process received modulated communication signals for a particular communication channel and to produce demodulated signals;

a channel rate estimation device configured to process the received communication signals for the particular communication channel and to produce channel change rate estimates;

a signal to noise ratio (SNR) estimation device configure to produce SNR estimates based on observation windows of a calculated number of samples of the received signal where the number of samples used for each observation window is calculated a function of the channel change rate estimates produce by the channel rate estimation device;

a combiner device configured to produce adjusted demodulated signals based on the demodulated signals produced by the demodulator and the SNR estimates produced by the SNR estimation device; and

an FEC decoder configured for decoding the adjusted demodulated signals and outputting decoded information bits.

2. The invention of claim 1 further comprising:

an observation window selection device configured to compute desired observation periods based on the channel change rate estimates produced by the channel rate estimation device and to output the computed desired observation periods to the SNR estimator device to control the number of samples used for the observation windows upon which the respective SNR estimates are based.

3. The invention of claim 2 wherein the channel rate estimation device is configured to produce channel change rate estimates R as follows:

$$R = \frac{1}{2\pi\,\Delta t} \underset{\substack{k \\ |h[k,t]|\neq 0 \\ |h[k,t+\Delta t]|\neq 0}}{Max} \arg\left(\frac{h[k,t]}{h[k,t-\Delta t]}\right)$$

where h[k,t] is the estimated channel impulse response at lag k, and time t.

4. The invention of claim 1 wherein the WTRU is configured for use in a Universal Mobile Telecommunications System (UMTS) as a user equipment (UE) or a base station.

5. The invention of claim 1, wherein the WTRU is configured for use in a communication system where the channel data is interleaved prior to transmission, further comprising a de-interleaver situated after the combiner device and in advance of the FEC decoder configured to perform an inverse of the interleaving process performed prior to transmission.

6. The invention of claim 5, wherein the WTRU is configured for use in a communication system that employs Hybrid Automatic Repeat Requests (H-ARQ), further comprising a retransmission combining device and a cyclic redundancy code (CRC) checking device, the CRC device configured to receive the output decoded information bits of the FEC decoder, conduct a cyclic redundancy check and to output the CRC checking results for use as an acknowledgement and for use by the retransmission combining device, and the retransmission combining device situated between the de-interleaver and FEC decoder and configured to operates in response to CRC checking results.

7. The invention of claim 1 wherein the demodulator, the channel rate estimation device, the SNR estimation device, and the combiner device are implemented on an application specific integrated circuit (ASIC).

8. The invention of claim 1 wherein the demodulator, the channel rate estimation device, the SNR estimation device, the combiner device and the FEC decoder are implemented on an application specific integrated circuit (ASIC).

9. The invention of claim 1 wherein the channel rate estimation device is configured to produce channel change rate estimates R as follows:

$$R = \frac{1}{2\pi\,\Delta t} \underset{\substack{|h[k,t]|\neq 0 \\ |h[k,t+\Delta t]|\neq 0}}{Max} \arg\left(\frac{h[k,t]}{h[k,t-\Delta t]}\right)$$

where h[k,t] is the estimated channel impulse response at lag k, and time t.

10. The invention of claim 9 wherein the demodulator, the channel rate estimation device, the SNR estimation device, the combiner device and the FEC decoder are implemented on an application specific integrated circuit (ASIC).

11. A method for implementing forward error detection decoding (FEC) of received wireless communication signals comprising:

processing received modulated communication signals for a particular communication channel to produce demodulated signals;

processing the received communication signals for the particular communication channel to produce channel change rate estimates;

producing signal to noise ratio (SNR) estimates based on observation windows of a calculated number of samples of the received signal where the number

of samples used for each observation window is calculated as a function of the produced channel change rate estimates;

producing an adjusted demodulated signals by combining the demodulated signals and the SNR estimates; and

forward error correction (FEC) decoding the adjusted demodulated signals to produce decoded information bits.

12. The method of claim 11 further comprising:

computing desired observation periods based on the channel change rate estimates and using the compute desired observation periods to control the number of samples used for the observation windows upon which respective SNR estimates are based.

13. The method of claim 12 wherein channel change rate estimates R are produced in accordance with the following equation:

$$R = \frac{1}{2\pi\,\Delta t} \underset{\substack{|h[k,t]|\neq 0 \\ |h[k,t+\Delta t]|\neq 0}}{Max} \arg\left(\frac{h[k,t]}{h[k,t-\Delta t]}\right)$$

where h[k,t] is the estimated channel impulse response at lag k, and time t.

14. The method of claim 11 wherein the method is implemented by a wireless transmit receive unit (WTRU) configured for use in a Universal Mobile Telecommunications System (UMTS) as a user equipment (UE) or a base station.

15. The method of claim 11, wherein the method is implemented by a wireless transmit receive unit (WTRU) configured for use in a communication system where the channel data is interleaved prior to transmission, further comprising performing an inverse of the interleaving process on the adjusted

demodulated signals to produce de-interleaved adjusted demodulated signals in advance of FEC decoding.

16. The method of claim 15, wherein the method is implemented by a wireless transmit receive unit (WTRU) configured for use in a communication system that employs Hybrid Automatic Repeat Requests (H-ARQ), further comprising cyclic redundancy code (CRC) checking of the output decoded information bits of the FEC decoder to produce CRC checking results and using the CRC checking results as an acknowledgement and for retransmission combining of the de-interleaved adjusted demodulated signals in advance of FEC decoding.

17. The method of claim 11 wherein the demodulating, the channel rate estimation, the SNR estimation and the combining of the demodulated signals and the SNR estimates are implemented in an application specific integrated circuit (ASIC).

18. The method of claim 11 wherein the demodulating, the channel rate estimation, the SNR estimation, the combining of the demodulated signals and the SNR estimates and the FEC decoding are implemented on an application specific integrated circuit (ASIC).

19. The method of claim 11 wherein channel change rate estimates R are produced in accordance with the following equation:

$$R = \frac{1}{2\pi\,\Delta t} \underset{\substack{k \\ |h[k,t]|\neq 0 \\ |h[k,t+\Delta t]|\neq 0}}{Max} \arg\left(\frac{h[k,t]}{h[k,t-\Delta t]}\right)$$

where h[k,t] is the estimated channel impulse response at lag k, and time t.

20. The method of claim 19 wherein the demodulating, the channel rate estimation, the SNR estimation, the combining of the demodulated signals and the SNR estimates and the FEC decoding are implemented on an application specific integrated circuit (ASIC).